PART 5

LM FOOD CHAIN

Chapter 6. Model Verification

5.6.1 Introduction

Model validation represents an independent test of a model's ability to reproduce measured PCB concentrations in Lake Michigan fish. Ideally, a calibrated model should be subsequently validated with another set of observed data that are independent of those used in the model calibration process. Additional sample collection and analysis for PCB concentrations in the Lake Michigan system is currently underway. Once completed, this work will provide a new PCB data set necessary for the validation of the food web models.

In this study, no particular procedures were performed to validate the calibrated food web models due to the limited data currently available. In fact, subsequent validation of a calibrated bioaccumulation model is rare because the necessary field data are not readily available.

5.6.2 Model Applicability to Other Sites

An alternative of model evaluation is to test the applicability of the calibrated models to other sites. For the lake trout food web models, this test was possible thanks to the extensive collection of PCB data at the three biota zones for this project. Because the lake trout food webs consist of the same predator and prey species among the three biota zones, the model parameters required for simulating bioaccumulation in the food webs should be identical at these three biota zones.   Therefore, model parameters calibrated for one biota zone could be

applied to model food web bioaccumulation at another biota zone. The agreement between the model results and the observed PCB data for the second biota zone could then be evaluated for the verification of the calibrated model parameters. Apparently, a properly calibrated model parameter set should be able to generate good fits for both biota zones. This exercise could serve as an independent test of how well the calibrated model represents fish bioaccumulation under different environmental characteristics and food web structures.

The calibration results presented in Chapter 5 show that the lake trout food webs at Sturgeon Bay and Saugatuck share a common set of parameter values (Table 5.5.2).   The identical parameter values for Sturgeon Bay and Saugatuck suggested that the model parameters calibrated for Sturgeon Bay could be satisfactorily applied to model the Saugatuck food web, and *vice-versa*.   In other words, the model parameters (Table 5.5.2) calibrated with observed data for Sturgeon Bay have been in effect verified with the observed data for the Saugatuck biota zone. Or conversely, the model parameters can be viewed as having been calibrated with the Saugatuck data and verified by the observed data for the Sturgeon Bay.

It should be pointed out that the identical calibrated parameter values obtained for the Sturgeon Bay and Saugatuck food webs were not achieved under a "blind test". In this sense, the applicability to both Sturgeon Bay and Saugatuck food webs did not necessarily constitute a strict validation of the calibrated models. This applicability, however, did provide us with a certain confidence about the model's performance at these two biota zones for its

intended purpose, which was to establish quantitative linkage between PCB levels in fish and exposure.

The food web model calibrated for Sheboygan Reef had a unique set of parameter values (see Table 5.5.3). This indicated that the calibrated model for this biota zone could not be validated with the observed data from Sturgeon Bay or Saugatuck. The reasons for this discrepancy were unclear. The mismatch in sampling locations for the observed PCB data for forage species and other food web components may be one explanation. Due to difficulty in collecting fish samples at Sheboygan Reef, the forage fish samples were collected near Port Washington instead of from the biota zone. It is possible that the observed PCB data for the forage fish species did not represent the actual contamination levels at Sheboygan Reef. Therefore, the food web model calibrated with the data may not be optimized properly.